What is claimed is:

1. A magnetoresistive sensor capable of sensing external magnetic fields when a sense current is applied in the planes of the layers in the sensor, the sensor comprising:

a substrate;

a pinned ferromagnetic layer on the substrate and having an in-plane magnetization direction oriented in a first direction and prevented from substantial rotation in the presence of an external magnetic field in the range of interest;

a nonmagnetic electrically-conductive spacer layer on the pinned layer;

a free ferromagnetic layer on the spacer layer and having an in-plane magnetization direction oriented substantially perpendicular to said first direction in the absence of an external magnetic field, said free layer magnetization direction being substantially free to rotate in the presence of an external magnetic field;

a first capping layer on the free layer, the first capping layer comprising one or more oxides of Zn; and

a second capping layer on the first capping layer, the second capping layer comprising an oxide of a metal having an oxygen-affinity greater than Zn.

2. The sensor of claim 1 wherein the first capping layer comprises ZnO.

3. The sensor of claim 1 wherein the second capping layer comprises one or more oxides selected from the group consisting of tantalum (Ta), aluminum (Al), hafnium (Hf), zirconium (Zr), yttrium (Y), titanium (Ti), tungsten (W), silicon (Si), vanadium (V), magnesium (Mg), chromium (Cr), niobium (Nb), molybdenum (Mo) and manganese (Mn).

4. The sensor of claim 3 wherein the second capping layer comprises one or more oxides of Ta.

5. The sensor of claim 4 wherein the second capping layer comprises Ta_2O_5.

6. The sensor of claim 1 wherein the first capping layer has a thickness in the range of approximately 5Å to 40Å.

7. The sensor of claim 1 wherein the second capping layer has a thickness in the range of approximately 10Å to 80Å.

8. The sensor of claim 1 further comprising an antiferromagnetic layer on the substrate, the pinned ferromagnetic layer being exchange-coupled to the antiferromagnetic layer.

9. The sensor of claim 8 further comprising a seed layer on the substrate, the antiferromagnetic layer being located on the seed layer.

10. The sensor of claim 1 wherein the pinned layer is an antiparallel-pinned layer.

11. The sensor of claim 1 wherein the free layer is formed of an alloy of one or more of Co, Fe and Ni.

12. The sensor of claim 10 wherein the free layer comprises a CoFe alloy.

13. A current-in-the-plane spin-valve (CIP-SV) magnetoresistive read head for reading magnetically recorded data from tracks on a magnetic recording medium, the head comprising:

a first read-head gap layer of electrically insulating material;

a layer of antiferromagnetic material on the gap layer;

a pinned ferromagnetic layer exchange-coupled to the antiferromagnetic layer and having an in-plane magnetization direction oriented in a first direction and prevented from substantial rotation in the presence of a magnetic field from the medium;

a nonmagnetic electrically-conductive spacer layer on the pinned layer;

a free ferromagnetic layer on the spacer layer and having an in-plane magnetization direction oriented substantially perpendicular to said first direction in the absence of an external magnetic field, said free layer magnetization direction being substantially free to rotate in the presence of a magnetic field from the medium;

a first capping layer on the free layer, the first capping layer comprising one or more oxides of Zn;

a second capping layer on the first capping layer, the second capping layer comprising an oxide of a metal having an oxygen-affinity greater than Zn; and

a second read-head gap layer of electrically insulating material on the second capping layer.

14. The head of claim 13 wherein the first capping layer comprises ZnO.

15. The head of claim 13 wherein the second capping layer comprises one or more oxides selected from the group consisting of tantalum (Ta), aluminum (Al), hafnium (Hf), zirconium (Zr), yttrium (Y), titanium (Ti), tungsten (W), silicon (Si), vanadium (V), magnesium (Mg), chromium (Cr), niobium (Nb), molybdenum (Mo) and manganese (Mn).

16. The head of claim 15 wherein the second capping layer comprises an oxide or oxides of Ta.

17. The head of claim 16 wherein the second capping layer comprises Ta_2O_5.

18. The head of claim 13 wherein the first capping layer consists essentially of an oxide of Zn having a thickness in the range of approximately 5Å to 40Å and the second capping layer consists essentially of an oxide of Ta having a thickness in the range of approximately 10Å to 80Å.

19. The head of claim 13 further comprising a seed layer on the first read-head gap layer, the antiferromagnetic layer being located on the seed layer.

20. The head of claim 13 wherein the pinned layer is an antiparallel-pinned layer.

21. The head of claim 13 wherein the free layer is formed of an alloy of one or more of Co, Fe and Ni.

22. The head of claim 21 wherein the free layer comprises a CoFe alloy.

23. A magnetic recording disk drive comprising:

a rotatable magnetic recording disk;

an air-bearing slider maintained near the surface of the disk and having an air-bearing surface facing the disk surface and a trailing surface substantially perpendicular to the air-bearing surface; and

the head of claim 13 located on the slider trailing surface, said in-plane magnetization direction of said pinned layer being oriented substantially perpendicular to the disk surface.